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**Earth Science Data and Information
System (ESDIS) Project Level 2
Requirements EOSDIS Core
System (ECS)**

Volume 1

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National Aeronautics and
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Goddard Space Flight Center
Greenbelt, Maryland

Earth Science Data & Information System (ESDIS) Project Level 2 Requirements EOSDIS Core System (ECS)

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Appendix A. Acronyms

Section 1. Introduction

1.1 SCOPE

This is a companion document to the Earth Science Data and Information System (ESDIS) Project Level 2 Requirements Volume 0: Overall ESDIS Project Requirements. This document presents the requirements for the EOSDIS Core System (ECS). Volume 0 should be used to understand the Mission to Planet Earth (MPE), the context of ECS and the requirements hierarchy. Requirements effecting ECS but controlled by the Earth Sciences Data and Information System (ESDIS) Project, such as mission baseline and instrument complement, can be found in Volume 0 and will be referenced but not repeated here.

The ECS will interoperate with other EOSDIS components and external interfaces such as the Science Computing Facilities (SCFs), EDOS, EBnet, Level 1 Product Generation System for Landsat 7 (LPGS), Spacecraft Ground support, Science Investigation support, Data Centers, ETS, User Support, IV&V Support, the International Ground system and the Global Change Data and Information System (GCDIS). Discussions of these systems can be found in the companion documents.

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Section 2. ECS Key Functional Objectives

Key functional objectives of ECS are:

1. Command and control of National Aeronautics and Space Administration (NASA) EOS spacecraft.
2. Processing and reprocessing of data from EOS spacecraft, EOS instruments on other spacecraft, and other data ingested as part of the mission baseline - ECS must support the generation of data products at level 1 through 4.
3. Data archival and distribution - ECS must be able to store all computed standard and special products during the mission life, and distribute requested subsets of them to users.
4. Information management - ECS must provide information about data (metadata) at adequate granularity and richness to permit easy location and selection of data of interest to users, so that, with user-friendly interfaces and browsing and visualization tools, they may decide which data to analyze more intensively.
5. Networks - ECS must provide electronic access to data and information, so that scientists can communicate with each other and with the system.
6. System Management - ECS must enable and assure, on a system-wide basis, the management of user access, system resources and system operations. System management must ensure the satisfaction of EOS scientific objectives and satisfaction of user needs.

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Section 3. ECS Level 2 Requirements

3.1 ECS Requirements

This section contains the requirements for the ECS overall system and the ECS functions.

3.1.1 Overall System

This section defines requirements which are applicable to the ECS as a system. It includes operational requirements and development requirements, as well as requirements for pre-launch, launch, and early orbit; integration and test; training; Reliability, Maintainability, Availability (RMA); and system access.

The ECS requirements support the development of the EOSDIS to be distributed, to encourage independent approaches to the solution of common problems and to provide for scientific expertise in the creation of geophysical and biological products from EOS data. The ECS requirements also support the EOSDIS to provide access to existing data sets, and experience with these will drive the evolutionary development needed to prepare for the launch of the EOS-AM spacecraft.

The ECS will support the integration and test activities of itself and external systems from the initial development phase until the completion of the EOS program. Integration and test activities include flight, ground, science, and operational elements.

3.1.1.1 General

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| 3.1.1.1.1 | The ECS shall be compatible with the spacecraft on-board data systems for formatting, transmission, and distribution services needed to achieve full end-to-end EOSDIS functionality. | 211242 |
| 3.1.1.1.2 | The ECS shall use the Space Network (SN) and EOSDIS Ground Stations for forward and return link data communications needed to achieve full end-to-end EOSDIS functionality. | 211234 |
| 3.1.1.1.3 | The ECS shall interface with the EOS Data and Operations System (EDOS) that provides data capture, Level Zero Processing, data archival, and distribution services needed to achieve full end-to-end EOSDIS functionality. | 211235 |
| 3.1.1.1.4. | The ECS shall use the SN, the Ground Stations at Alaska and Norway, and the Wallops Orbital Tracking Station (WOTS) for forward and return link data communications in a back-up contingency mode. | 211539 |
| 3.1.1.1.5 | ECS shall support archiving of EOS and related non-EOS data and products. | 211134 |

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- 3.1.1.1.6 The ECS shall use NASA institutional facilities, i.e., NASA Communication NASCOM, Network Control Center (NCC), Program Support Communications Network (PSCN), NASA Science Internet (NSI), and the Flight Dynamics Facility (FDF) for data communications, SN scheduling and operations coordination, and orbit and attitude determination services to achieve full end-to-end EOSDIS functionality. 211540
- 3.1.1.1.7 The ECS shall be modular in design and conform to commonly accepted system development standards. 211017
- 3.1.1.1.8 The ECS shall be designed such that replacement of any one module does not adversely impact any other interfacing module. 211018
- 3.1.1.1.9 The ECS shall be expandable to facilitate updates in instrument data products and algorithms, particularly with respect to storage capacity and processing capability. 211131
- 3.1.1.1.10 ECS internal design changes shall be transparent to the users except where approved by the Science Advisory Panel or the user community. 210870
- 3.1.1.1.11 The ECS shall employ commercial and government standards to the maximum extent possible as evaluated and accepted by the GSOP with the advice of the user community. 211016
- 3.1.1.1.12 The ECS shall not degrade any data beyond the Grade of Service limitation by which it was received from the spacecraft. 211162
- 3.1.1.1.13 The ECS shall contribute no more than 2.5 seconds to the end-to-end loop delay for ESDIS real-time commanding of the spacecraft in compliance with ESDIS Project Level 2 Requirements Volume 0 Overall ESDIS Project Requirements: requirement xxxx. 210576
- 3.1.1.1.14 The ECS shall maximize the scientific return from the EOS program with the most economical use of resources throughout the life of the program. 210509
- 3.1.1.1.15 The ECS shall employ Consultative Committee on Space Data Systems (CCSDS), Committee on Earth Observing System (CEOS), and other commercial and government standards for data interchange where applicable. 211383
- 3.1.1.1.16 All ECS software shall be highly portable, and shall avoid dependence on any particular vendor computer hardware system, database management system, or networking capability. Any unavoidable dependencies on specific vendor hardware shall be implemented with ESDIS Project approval, isolated, and well documented. 211385
- 3.1.1.1.17 The Integrated Logistics Support (ILS) technical disciplines shall be included in planning the design, development, and operations phase of EOSDIS. 211386

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| 3.1.1.1.18 | The ECS shall provide the capabilities to support end-to-end system performance analysis. | 211282 |
| 3.1.1.1.19 | The ECS shall monitor its own performance and the performance of the related external systems/communications, and provide periodic status reports. | 211243 |
| 3.1.1.1.20 | The ECS shall coordinate operations with external data and information systems, external operations control centers, and external networks. | 211248 |
| 3.1.1.1.21 | The ECS shall maximize opportunities for commonality within the system. | 210518 |
| 3.1.1.1.22 | The ECS shall support the Global Change Data and Information System (GCDIS) requirements relevant to ECS as specified in the ESDIS Project Level 2 Requirements Volume 0: Overall ESDIS Project requirements. | 211606 |
| 3.1.1.1.23 | The ECS shall be developed in accordance with the architectural design criteria in the ESDIS Project Level 2 Requirements Volume 0, section 5.8. | 211607 |
| 3.1.1.1.24 | ECS shall support the mission baseline identified in the ESDIS Project Level 2 Requirements Volume 0: Overall ESDIS Project Requirements. | 211579 |
| 3.1.1.1.25 | The ECS shall support the ESDIS Project requirements relevant to ECS as specified in the ESDIS Project Level 2 Requirements Volume 0: Overall ESDIS Project Requirements. | 211577 |
| 3.1.1.1.26 | The ECS shall schedule, monitor, and control EOSDIS Ground Station operations. | 211620 |
| 3.1.1.2 | Integration & Test | |
| 3.1.1.2.1 | The ECS shall support independent element, system and subsystem integration and test activities of the end-to-end EOSDIS, throughout its life. | 211264 |
| 3.1.1.2.2 | The ECS shall support the revalidation of performance capabilities whenever an element(s) upgrade/enhancement is made which may cause a change in performance. | 211261 |
| 3.1.1.2.3 | The ECS shall provide tools and metrics to support testing, fault isolation, verification, and validation of the end-to-end ground system. | 211322 |
| 3.1.1.2.4 | The ECS shall provide fault isolation tools at the element, system, and subsystem levels. | 211262 |
| 3.1.1.2.5 | The ECS shall provide tools to support fault isolation between ECS elements and external interfaces. | 211263 |
| 3.1.1.2.6 | The ECS shall provide benchmark tests and standard data sets. | 211054 |
| 3.1.1.2.7 | The ECS shall provide the capability to interface with and use spacecraft and payload simulators. | 211323 |

3.1.1.3 Pre-Launch Support

- 3.1.1.3.1 The ECS shall support the instrument science team(s) in the pre-launch checkout of their instruments. 211236
- 3.1.1.3.2 The ECS shall be capable of processing real and simulated EOS data in support of pre-launch checkout of the spacecraft. 211115
- 3.1.1.3.3 The ECS shall provide sample command and data loads to EDOS in support of pre-launch checkout of the spacecraft. 210976
- 3.1.1.3.4 The ECS shall interface with pre-launch test facilities at the Western Space and Missile Center (WSMC, formerly Western Test Range [WTR]) and the spacecraft integration test facility at the spacecraft contractor's plant. 211388

3.1.1.4 Launch, Early Orbit, and Disposal Support

- 3.1.1.4.1 The ECS shall support the instrument science team(s) during early orbit checkout of their instruments. 211116
- 3.1.1.4.2 The ECS shall support development of initial calibration information through data processing and reprocessing, and provide access to available correlative data placed in the EOSDIS data set. 210954
- 3.1.1.4.3 The ECS shall support all of the spacecraft mission phases and mission modes. 211391

3.1.1.5 Training

- 3.1.1.5.1 The ECS shall provide appropriate training, training aids, and simulations to science investigators on the use of hardware and software provided to them. 211120
- 3.1.1.5.2 The ECS shall provide appropriate training, training aids, and simulations to operators and technicians for each ECS component. 211121
- 3.1.1.5.3 The ECS shall provide documentation and training, as necessary, to the various users on how to access the system, types of information that are available, security levels, etc. 211122

3.1.1.6 Reliability Maintainability Availability

- 3.1.1.6.1 The ECS shall be maintainable. 211020
- 3.1.1.6.2 Critical ECS functions shall have reliability, maintainability, and availability (RMA) requirements with availabilities and average down times commensurate with the level of criticality. 211249
- 3.1.1.6.3 The ECS shall have no single point of failure for functions associated with real-time operations. 211392

3.1.1.7 System Access

- 3.1.1.7.1 The ECS shall provide users with access to local information management services at the active archives. 211393
- 3.1.1.7.2 The user shall have access at all access nodes to the full range of information management services spanning the whole of EOSDIS. 211394
- 3.1.1.7.3 The ECS shall always be accessible to users and an informational status message describing the current availability status of EOSDIS services and the predicted time for resumption of services which are temporarily unavailable shall be provided. 211395
- 3.1.1.7.4 All users shall access the EOSDIS ground segment through Information Management services at one of the system access nodes. 211396
- 3.1.1.7.5 The ECS shall be capable of presenting the current data acquisition plan to the user and sufficient information on data acquisition options and constraints to facilitate the construction and submission of a reasonable data acquisition request (DAR). 211166
- 3.1.1.7.6 The ECS shall provide data subsetting, data visualization, and data summary capability for the following functions: 1) Visualization of products which have been precomputed or generated in response to a user request for predefined subsetting options; 2) Preordering selection; and 3) Quality control (anomaly detection). 211399
- 3.1.1.7.7 The ECS shall provide capacity for science user development extensions as defined in the ESDIS Project Level 2 Requirements Volume 0: Overall ESDIS Project Requirements section 5.8.5 Science Users Development Extensions. 211398
- 3.1.1.7.8 The ECS user interface shall be tailored to the level of user expertise and to the functions which are authorized for the user. 211397
- 3.1.1.7.9 The ECS shall take advantage of local user workstations to optimize system performance. 211603
- 3.1.1.7.10 The ECS shall provide access to EOSDIS facilities, information, and services from user workstations. 211423

3.1.1.8 Security

- 3.1.1.8.1 The ECS shall support system wide security protection measures. 211252
- 3.1.1.8.2 The ECS shall provide multi-level user access, authorization, and validation controls. 211253
- 3.1.1.8.3 The ECS shall provide and support communication (including networks) security controls. 211254

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| 3.1.1.8.4 | The ECS shall provide the capability for data protection controls and audit trails for applicable data. | 211256 |
| 3.1.1.8.5 | The ECS shall support security management, risk analysis, training, and operations. | 211257 |
| 3.1.1.8.6 | The ECS shall provide access monitoring to compile and report security violations and attempted security violations. | 211455 |

3.1.1.9 End-to-End Fault Management

The ECS end-to-end fault management requirements address the ability of the ECS to support fault identification, isolation, and correction on an EOSDIS-wide basis, including the flight segment.

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| 3.1.1.9.1 | The ECS shall support end-to-end system testing and fault isolation. | 211187 |
| 3.1.1.9.2 | The ECS shall maintain knowledge of current operational status of all EOSDIS elements. | 210906 |
| 3.1.1.9.3 | The ECS shall have a capability, under predefined circumstances, to respond with safety actions in response to the detection of faults or errors. | 210873 |
| 3.1.1.9.4 | The ECS shall support NASA institutional fault isolation and management systems. | 211088 |
| 3.1.1.9.5 | The ECS shall support on-board monitoring functions provided by spacecraft and instruments for fault identification, isolation, and protection. | 210945 |
| 3.1.1.9.6 | The ECS shall generate alarms when spacecraft or instrument parameters are out of limits. | 210872 |
| 3.1.1.9.7 | The ECS shall identify and report all processing system faults. | 211346 |
| 3.1.1.9.8 | The ECS shall support the analysis of end-to-end system errors. | 211142 |

3.1.2.0 ECS Functions

This section addresses the requirements associated with the ground-based spacecraft control and data management elements of EOSDIS. Included in this section are operations which require input and interaction between users and the spacecraft and between users and data. While the requirements are at a high-level, they are directed to specific functions required for mission operations, data management, and system integrity. The ground segment requirements are arranged by functional area in the time-sequence of their occurrence in the nominal mission and data operations process. Targets of Opportunity (TOOs) refer to newly identified data acquisition opportunities that result in late changes to spacecraft schedules to accommodate science requirements. The term "external instrument control center" includes control centers provided by International partners for the control of their instruments on U.S. EOS spacecraft.

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| 3.1.2.0.1 | The ECS shall be able to accommodate growth (e.g., capacity) in all of its functions as well as the addition of new functions. | 211324 |
| 3.1.2.0.2 | The ECS shall provide timely interactive response to multiple concurrent users for data search and order services. | 211344 |
| 3.1.2.0.3 | The ECS shall provide the capability for users to interactively access the system to develop DARs and to query metadata. | 211401 |
| 3.1.2.0.4 | The ECS shall deliver products via the most cost effective media in a time commensurate with user needs. | 211402 |
| 3.1.2.0.5 | The ECS shall perform the end-to-end data accountability function including data transmitted, received and processed through EDOS and EOSDIS. | 211403 |
| 3.1.2.0.6 | The ECS shall receive operations parameters and procedures from the spacecraft and instrument developers. | 211404 |
| 3.1.2.0.7 | The ECS shall interface with the simulations and test capabilities of the spacecraft simulators to validate the spacecraft control and monitoring functions. | 211548 |
| 3.1.2.0.8 | The ECS shall perform management and coordination of all standard data products through request, processing, archival, retrieval and distribution. | 211491 |

3.1.2.1 Mission Planning and Scheduling

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| 3.1.2.1.1 | The ECS shall plan and schedule EOS data acquisitions in accordance with the EOS mission science plan and long-term instrument operation plan including updates from the International Coordinating Working Group (ICWG) and Investigator Working Group (IWG) as provided to ECS via the Project Scientist. | 210944 |
| 3.1.2.1.2 | Each week the ECS shall develop an EOS short-term operations plan covering a 28-day period starting the next week for each spacecraft. | 211098 |
| 3.1.2.1.3 | The ECS shall accept request from authorized users for specific observational sequences for one or more EOS instrument(s) prior to 28 days before actual observations and shall accept modifications to the accepted request up to 7 day prior to observation. | 210596 |
| 3.1.2.1.4 | The ECS shall generate specific activity sequences for U.S. spacecrafts prior to 28 days before the actual activities and make modifications up to 7 days prior to the activities. | 211405 |
| 3.1.2.1.5 | The ECS shall have the capability to plan for spacecraft and/or instrument engineering activities in the EOS short term operations plan. | 211407 |
| 3.1.2.1.6 | The ECS shall accept requests from authorized instrument team members for instrument engineering activities prior to 28 days before the planned | |

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| | activity and shall accept modifications to the accepted request up to 7 days prior to the activity. | 211408 |
| 3.1.2.1.7 | The ECS shall receive from the FDF predicted orbit data and related information for the EOS spacecraft with the accuracy necessary to support the planning and scheduling of the EOS spacecraft and instruments, the EOSDIS Ground Stations and the AM-1 backup Ground Stations. | 211410 |
| 3.1.2.1.8 | The ECS shall provide spacecraft resource availability information to an external instrument control center to support the planning and scheduling of their instruments on U.S. spacecrafts. | 211326 |
| 3.1.2.1.9 | The ECS shall provide to an external instrument control center predicted orbit data and related information for U.S. spacecrafts with the accuracy necessary to support the planning and scheduling of their instruments on U.S. spacecrafts. | 211335 |
| 3.1.2.1.10 | For each day, the ECS shall provide a conflict-free schedule for each spacecraft covering the next 7 days. | 210637 |
| 3.1.2.1.11 | The ECS shall interface an external instrument control center to coordinate the schedule of external instrument control center's instruments on the spacecraft. | 211334 |
| 3.1.2.1.12 | The ECS shall be able to modify the conflict-free schedule until 24 hours in advance of actual observation. | 211101 |
| 3.1.2.1.13 | The ECS shall make all relevant planning and scheduling information including the current short-term operations plan and conflict-free schedule accessible to authorized users on request. | 211325 |
| 3.1.2.1.14 | The ECS shall be capable of accepting requests in support of Targets of Opportunity (TOOs) or critical instrument support activities that do not impact previously scheduled activities (but may impact unscheduled resources) until 6 hours prior to the observation or activity. | 211099 |
| 3.1.2.1.15 | The ECS shall plan and schedule spacecraft and instrument activities that support their health and accurate operation (e.g., calibrations). | 211135 |
| 3.1.2.1.16 | The ECS shall plan and schedule the spacecraft and instrument operations to use the EOSDIS Ground Stations, and the AM-1 backup Ground Stations. | 211550 |
| 3.1.2.1.17 | The ECS shall develop contingency plans to provide immediate preplanned responses (i.e., command sequences) to a set of likely or anticipated failure modes (i.e., emergency conditions) including both the spacecraft and EOS instruments. | 211137 |
| 3.1.2.1.18 | The ECS shall coordinate the development of observing plans with and between authorized users and resolve resource and observational sequence schedule conflicts in consultation with the Project Scientist if needed. | 210632 |

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| 3.1.2.1.19 | The ECS shall coordinate observations between the EOS spacecraft, the EOS instruments, and ground-based observations. | 211551 |
| 3.1.2.1.20 | The ECS shall provide interactive planning tools to authorized users. | 210571 |
| 3.1.2.1.21 | The ECS shall be capable of accepting requests in support of Targets of Opportunity (TOOs) observations or critical instrument support activities which require only real-time commands (and do not impact previously schedule resources or activities) until one hour of prior to the next scheduled TDRSS contact. | 211268 |
| 3.1.2.1.22 | The ECS shall be capable of accepting requests in support of Target of Opportunity (TOOs) or critical instrument support activities that impact previously scheduled resources or activities until 24 hours prior to the observation or activity. | 211269 |
| 3.1.2.1.23 | The ECS shall be capable of rescheduling observation sequences necessitated by malfunction or special events affecting external resources. | 210597 |
| 3.1.2.1.24 | The ECS shall coordinate the scheduling of Space Network resources with the NCC. | 211412 |
| 3.1.2.1.25 | The ECS shall receive from the FDF orbit control parameters and procedures needed for spacecraft orbit adjustment. | 211552 |
| 3.1.2.1.26 | The ECS shall schedule EOSDIS Ground Station resources. | 211621 |
| 3.1.2.2 Mission Operations | | |
| 3.1.2.2.1 | The ECS shall be capable of supporting multiple spacecraft and their instruments simultaneously. | 211143 |
| 3.1.2.2.2 | The ECS shall coordinate with an external instrument control center for the operation of that external instrument control center's instrument on U.S. spacecrafts. | 211369 |
| 3.1.2.2.3 | The ECS shall monitor, as necessitated by the instrument operation, instrument environmental parameters and instrument performance statistics. | 210874 |
| 3.1.2.2.4 | The ECS shall receive status information on SN, EOSDIS Ground Stations, EDOS, and EBnet. | 211413 |
| 3.1.2.2.5 | The ECS shall receive via EDOS all operational data from the EOS spacecraft. | 211414 |
| 3.1.2.2.6 | The ECS shall process raw telemetry data streams to identify discontinuities in the data and to extract specified parameters. | 211553 |
| 3.1.2.2.7 | The ECS shall support the monitoring of instrument data quality using the calibration and processing algorithms. | 211273 |

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| 3.1.2.2.8 | The ECS shall generate operations history, including schedules, command histories, and information derived from telemetry data, for the spacecraft and instruments that the ECS supports. | 211331 |
| 3.1.2.2.9 | The ECS shall provide the capability for authorized investigators to provide inputs to mission operations activities and monitor operations activities for their instruments while at their institutions. | 211416 |
| 3.1.2.2.10 | The ECS shall process spacecraft housekeeping data (both realtime and playback) as necessary to monitor onboard system configuration, subsystem operations, and spacecraft resources. | 211417 |
| 3.1.2.2.11 | The ECS shall process all instrument telemetry (both realtime and playback) as necessary to monitor instrument configuration, instrument subsystem operations, and instrument resources. | 211554 |
| 3.1.2.2.12 | The ECS shall process housekeeping data, instrument engineering telemetry data, as necessary to verify receipt and execution of the commands by the instruments and spacecraft. | 211555 |
| 3.1.2.2.13 | The ECS shall monitor the operations and performance of the spacecraft and instruments, via telemetry, to detect and report malfunctions, unsafe conditions, failures, or performance degradations. | 211418 |
| 3.1.2.2.14 | The ECS shall manage its configuration, manage ground system faults, control access to its systems, and monitor its performance in support of mission operations. | 211419 |
| 3.1.2.2.15 | The ECS shall process real-time spacecraft and instrument housekeeping data for health and safety checks as the data are being received. | 211428 |
| 3.1.2.2.16 | The ECS shall provide a user interface that allows operators to monitor and analyze spacecraft and instrument activities, to control local ground segment operations and configurations, to perform mission planning and scheduling functions, and to resolve instrument anomalies in conjunction with the appropriate instrument representative. | 211429 |
| 3.1.2.2.17 | The ECS shall maintain instrument and spacecraft characteristics (e.g., telemetry formats) which are necessary for operational control of the U.S. spacecraft and instruments. | 211557 |
| 3.1.2.2.18 | The ECS shall send attitude and orbit related housekeeping data to FDF. | 211492 |
| 3.1.2.2.19 | The ECS shall provide mission status information to and receive instrument status information from the external instrument control centers in support of mission monitoring. | 211559 |
| 3.1.2.2.20 | The ECS shall interface to external instrument control centers in accordance with an ECS standard interface. | 211608 |

- 3.1.2.2.21 The ECS shall be capable of expanding to accommodate the operation of U.S. instruments on international partner spacecraft without major redesign. 211598

3.1.2.3 Command and Control

- 3.1.2.3.1 The ECS shall generate and validate command sequences based on the schedule. 211431
- 3.1.2.3.2 The ECS shall generate, validate, and store command sequences for later use in emergency situations. 210946
- 3.1.2.3.3 The ECS shall be capable of initiating emergency preplanned command sequences to protect the health and safety of EOS instruments and spacecraft. 211333
- 3.1.2.3.4 The ECS shall manage EOS spacecraft and instrument real-time and stored commands, including software and microprocessor loads, and forward them for uplink to the spacecraft. 210626
- 3.1.2.3.5 The ECS shall receive, verify, and implement spacecraft flight software loads (or updates) from the flight software development and validation facilities, and provide them with flight software dumps for diagnostic purposes. 211432
- 3.1.2.3.6 The ECS shall receive instrument command sequences from external instrument control centers and combine them with spacecraft and other instrument command sequences. 211147
- 3.1.2.3.7 The ECS shall forward command sequences to the EDOS for transmission to the spacecraft. 211434
- 3.1.2.3.8 The ECS shall interface with an external instrument control center to exchange command status information for the external instrument control center's instrument. 211560
- 3.1.2.3.9 The ECS shall provide the capability to respond to detected limits being exceeded on the spacecraft. 211332
- 3.1.2.3.10 The ECS shall generate and validate command sequences to control the operation of the x-band direct down link. 211367
- 3.1.2.3.11 The ECS shall validate commands for NASA EOS instruments and spacecraft to the extent necessary to assure the safety of the instruments and spacecraft. 211561

3.1.2.4 Data Input

- 3.1.2.4.1 The ECS shall ingest EOS data products generated by researchers and investigators. 210614

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| 3.1.2.4.2 | The ECS shall be able to ingest the science, engineering, and ancillary data that was acquired by the U.S. spacecrafts and the instruments on the U.S. spacecrafts. | 211093 | |
| 3.1.2.4.3 | The ECS shall be capable of ingesting selected data from International Partner archives. | 211338 | |
| 3.1.2.4.4 | The ECS shall ingest non-EOS correlative (e.g., in-situ) and ancillary digital data required to generate and validate standard products. | 210570 | |
| 3.1.2.4.5 | The ECS shall maintain accountability for all ingested data, including correlative and ancillary. | 210661 | |
| 3.1.2.4.6 | The ECS shall monitor incoming data and report any data that does not arrive on schedule. | 211337 | |
| 3.1.2.4.7 | The ECS shall accommodate peak and average data rates and volumes commensurate with EOS observatories. | 211247 | |
| 3.1.2.4.8 | The ECS shall be able to ingest approved non-EOS data needed to facilitate Earth science research, including data from other NASA flight projects. | 211436 | |
| 3.1.2.4.9 | The ECS shall be able to ingest definitive orbit and attitude data from the FDF. | 211437 | |
| 3.1.2.4.10 | The ECS shall ingest from the external instrument control centers instrument operations history, command histories, engineering and housekeeping data and associated metadata. | 211564 | |
| 3.1.2.4.11 | The ECS shall have the capability to ingest documentation. | 211602 | |
| 3.1.2.4.12 | The ECS shall be able to ingest refined orbit data from the FDF. | 211627 | CH03 |
| 3.1.2.5 Data Processing | | | |
| 3.1.2.5.1 | The ECS shall plan and schedule EOS data processing in accordance with EOS science plan and instrument operation plans from the IWG. | 211158 | |
| 3.1.2.5.2 | The ECS shall process all designated Level 0 EOS instrument data to Level 1 standard data products and make them available within 24 hours after the availability to EOSDIS of Level 0 and any other necessary input data sets. | 211092 | |
| 3.1.2.5.3 | The ECS shall process designated Level 1 EOS data to Level 2 standard data products and make them available within 24 hours after the availability to EOSDIS of Level 1 and any other required input data sets. | 210649 | |
| 3.1.2.5.4 | The ECS shall process designated Level 2 EOS data to Level 3 standard data products and make them available within 24 hours after the availability to EOSDIS of Level 2 and any other required input data sets. | 210885 | |

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| 3.1.2.5.5 | The ECS shall process designated Level 3 EOS data to Level 4 standard data products and make them available nominally within 1 week after the availability to EOSDIS of all necessary input data sets. | 211152 |
| 3.1.2.5.6 | The ECS shall generate standard browse data sets and supporting metadata within the same timelines as the generation of standard data products. | 210636 |
| 3.1.2.5.7 | The ECS shall support the priority processing of selected EOS data in response to Targets of Opportunity, field experiments, etc. | 211272 |
| 3.1.2.5.8 | The ECS shall support the generation of special data products. | 211153 |
| 3.1.2.5.9 | The ECS shall maintain accountability for all processed data retained within the system. | 210635 |
| 3.1.2.5.10 | The ECS shall monitor data processing operations and maintain status information. | 211339 |
| 3.1.2.5.11 | The ECS shall generate prototype data products, but such processing shall not interfere with standard data product generation. | 211565 |
| 3.1.2.5.12 | The ECS shall have the capability to support the use of in-situ data in the processing and validation of EOS data sets. | 210948 |
| 3.1.2.5.13 | The ECS shall maintain and provide audit trails between processed science data and associated calibration, navigation, and other ancillary information. | 210949 |
| 3.1.2.5.14 | The ECS shall support the processing of interdisciplinary data products. | 211154 |
| 3.1.2.5.15 | The ECS shall provide support for the quality assessment of data and standard data products in conjunction with the SCFs. | 210892 |
| 3.1.2.5.16 | The ECS shall receive and distribute expedited data to support calibration and anomaly investigations. | 210583 |
| 3.1.2.5.17 | The ECS shall support the development and validation of calibration and processing algorithms, and associated software. | 210644 |
| 3.1.2.5.18 | The ECS shall provide the capability to replace processing algorithms under configuration control. | 211155 |
| 3.1.2.5.19 | The ECS shall provide the capability for Principal Investigator/Team Leader/Interdisciplinary Investigator (PI/TL/II) processing algorithms to be integrated into the automated production processing system. | 211156 |
| 3.1.2.5.20 | The ECS shall provide common services, accessible from each of the supported languages, to be used by processing algorithms when interfacing with the automated production processing system. | 211438 |
| 3.1.2.5.21 | The ECS shall support access to science processing routines (e.g., orbit and attitude interpolation, image handling, format conversion) which may be incorporated by investigators into their science processing algorithms. | 211439 |

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| 3.1.2.5.22 | The ECS shall provide sufficient processing capability to permit the reprocessing of all EOS science data at at least twice the original processing rate, concurrently with processing of new data. | 210947 | |
| 3.1.2.5.23 | The ECS shall process pre-launch test data and provide test data product samples for user verification. | 211440 | |
| 3.1.2.5.24 | The ECS shall support the generation and distribution of hard copy and photographic data products. | 211441 | |
| 3.1.2.5.25 | The ECS shall coordinate product generation among the distribution processing sites to facilitate scheduling of inter-center product dependencies. | 211445 | |
| 3.1.2.5.26 | The ECS shall have the capability to generate calibrated spacecraft ancillary data. | 211585 | |
| 3.1.2.5.27 | The ECS shall provide sufficient processing capability to support algorithm integration and test concurrently with processing of new data. | 211586 | |
| 3.1.2.5.28 | The ECS shall be capable of expanding to accommodate data ingest and processing for U.S. instruments on international partner spacecraft without major redesign. | 211599 | |
| 3.1.2.5.29 | The ECS shall provide the capability for NASA institutional facility-provided algorithms or software to be integrated into the automated production processing system. | 211622 | CH03 |
| 3.1.2.6 Data Storage | | | |
| 3.1.2.6.1 | The ECS shall provide storage for planning and scheduling information and management data including detailed quality and accounting reports, daily operations and performance summaries, status reports, anomaly reports and resolutions. | 210894 | |
| 3.1.2.6.2 | The ECS shall provide storage for instrument, payload, and spacecraft status, anomaly reports, anomaly resolution, and other operational history. | 211160 | |
| 3.1.2.6.3 | The ECS shall provide for storage of complete command histories, including instrument and spacecraft responses for the duration of the mission. | 210580 | |
| 3.1.2.6.4 | The ECS shall provide storage for science products and the associated ancillary, engineering, calibration, and correlative data for the duration of the mission. | 210623 | |
| 3.1.2.6.5 | The ECS shall store data sets produced by researchers as part of their research work, including algorithms, source code, calibration and test procedures, and documentation reports produced. | 210662 | |
| 3.1.2.6.6 | The ECS shall provide storage for software which supports the production processing, algorithms, test and calibration procedures, calibration files, results of science data quality assessments, test plans, and appropriate documentation and science literature. | 210621 | |

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| 3.1.2.6.7 | The ECS data maintenance program for all archived data and products shall comply with National Archive and Records Administration (NARA) and National Institute of Standards and Technology (NIST) standards. | 211566 |
| 3.1.2.6.8 | The ECS shall generate metadata for all data when stored. | 210607 |
| 3.1.2.6.9 | The ECS shall store data and related metadata in a standard, fully-defined format. | 211447 |
| 3.1.2.6.10 | The ECS shall provide quality information with the spacecraft parameters prior to archiving. | 211448 |
| 3.1.2.6.11 | The ECS ground segment shall provide safe storage back-up for all EOS data which would be impossible or difficult to recover in case of loss, e.g., metadata, command history, algorithms, engineering data, calibration data, systems software, selected higher level data products, etc. | 211449 |
| 3.1.2.6.12 | The ECS shall archive data products produced by selected NASA non-EOS Earth Science Flight Projects following completion of its primary mission phase. | 211493 |
| 3.1.2.6.13 | The ECS shall be capable of storing multiple versions of reprocessed data sets. | 211442 |
| 3.1.2.6.14 | The ECS shall archive Level zero (L0) data where Level 1A (L1A) is not generated. | 211444 |
| 3.1.2.6.15 | The ECS shall employ archive quality media for archival. | 211567 |
| 3.1.2.6.16 | The ECS shall receive and archive science data at an average rate greater than the average instrument collection rate. | 211609 |
| 3.1.2.7 | Data Distribution | |
| 3.1.2.7.1 | Upon receipt of a request, the ECS shall make stored data products available for delivery to the requestor within an average of 5 minutes for electronically distributed data and a maximum of 24 hours for data to be distributed on physical media. | 211341 |
| 3.1.2.7.2 | The ECS shall provide convenient access to EOS data and data information and subsets thereof. | 210651 |
| 3.1.2.7.3 | The ECS shall be capable of distributing any data granule stored. | 210625 |
| 3.1.2.7.4 | The ECS shall use and support NASCOM, EBnet, PSCN, NSI, and other networks to secure the data distribution capabilities needed to achieve full end-to-end EOSDIS functionality. | 211133 |
| 3.1.2.7.5 | The ECS shall monitor and account for data transfer between all elements of the system. | 210599 |
| 3.1.2.7.6 | The ECS shall provide routing subscription distribution services. | 211569 |
| 3.1.2.7.7 | (Deleted) | |
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3.1.2.8 Communications and Networking

- 3.1.2.8.1 The communications and networks utilized or provided by the ECS shall include such management functions as configuration management, performance management, fault management, security management, accounting management and directory service. 211275
- 3.1.2.8.2 The ECS shall establish and maintain accounting information on communications and networks used or provided by the ECS. 211171
- 3.1.2.8.3 The ECS shall establish and maintain directory services on communications and networks used or provided by the ECS. 211172
- 3.1.2.8.4 The ECS shall establish and maintain configuration information on communications and networks used or provided by the ECS. 211173
- 3.1.2.8.5 The ECS shall establish and maintain performance management on communications and networks used or provided by the ECS. 211342
- 3.1.2.8.6 The ECS shall provide and maintain a system of multi-level access security to all segments of the EOSDIS for the communications and networks used or provided by ECS. 211174
- 3.1.2.8.7 The ECS shall be designed to accommodate growth in data rates and volumes for communications and networks used or provided by the ECS, permitting the addition or removal of network links or system elements without disruption of network service. 211177
- 3.1.2.8.8 The communications and networks utilized or provided by the ECS shall make maximum practicable use of standards for data transportation defined by the International Standards Organization's "open system interconnect" and shall meet the Government Open System Interconnection Profiles (GOSIP) requirement. 211178
- 3.1.2.8.9 The ECS shall provide system verification and evaluation test definitions for transmission quality testing of the communications and networks used or provided by the ground segment. 211175
- 3.1.2.8.10 The communications and networks utilized or provided by the ECS shall be capable of being tested during all phases of EOSDIS development and mission operations without interfering with the normal communications and networking traffic. 211180
- 3.1.2.8.11 The ECS shall be capable of identifying the failing node, element and/or service to the level necessary to correct the fault for the communications and networks used or provided by the ECS. 211176
- 3.1.2.8.12 The communications network shall enable the distributed elements of the ECS to operate as a single integrated and cohesive information system allowing users to transparently access services of EOSDIS without any

special knowledge of the location and function of the distributed element or the routing or gateway services being used. 211450

3.1.2.8.13 The ECS shall provide access to communications services such as file transfer, multi-media mail and bulletin boards. 211605

3.1.2.9 Information Management

3.1.2.9.1 The ECS shall maintain an electronically accessible archive of the spacecraft and instrument operations history, algorithm and software versions, and data processing parameters, sufficient to enable science users and instrument engineers to follow a data audit trail to establish the probable cause of anomalies in data products. 210871

3.1.2.9.2 The ECS shall maintain documentation, in an electronically accessible format, recording current and historical information about processing EOS data. This documentation will include, but not be limited to: 1) Documentation of calibration procedures and results over the course of an experiment. 2) An historical record of EOSDIS software, algorithms, and non-EOS data sets used in the processing and analysis of EOS data. Documentation of the calibration, processing, and analysis software and procedures should support the capability to reproduce the original processing sequence. 211169

3.1.2.9.3 The ECS shall maintain documentation, in an electronically accessible format, recording current and historical information about research and science data quality assessment of EOS data. This documentation will include but not be limited to: 1) Results of science data quality assessments of EOS data. 2) Bibliography of published and unpublished literature (as available) derived from the project and searchable by attributes. 3) Cross references between differing studies of the same data. 211170

3.1.2.9.4 The ECS shall allow a user to locate, identify, and acquire desired data and supporting metadata, in the context of his or her research, without having to understand the system's architecture, database management system, database structure, query languages, and data formats. 211167

3.1.2.9.5 The ECS shall provide, or provide access to, a master directory, that may be geographically distributed, and which is a master directory of all available information that describes whole data sets in the Earth science disciplines. 211287

3.1.2.9.6 The ECS shall maintain on-line information that individually describes each granule of data where granule refers to the minimum catalogued unit of data that can be selected by the user to be copied or, optionally, subsetted, and delivered. 210586

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| 3.1.2.9.7 | The ECS shall supply a uniform user interface for access to heterogeneous data formats, communications networks, databases, and applications that are geographically dispersed. | 210606 |
| 3.1.2.9.8 | The ECS shall accept on-line and off-line requests for data and data information, and monitor the response until the request is satisfied. | 210876 |
| 3.1.2.9.9 | The ECS data selection and ordering service shall provide the capability to visualize metadata and summary data products produced to aid the selection process. | 211165 |
| 3.1.2.9.10 | The ECS shall have available for user access metadata information for non-EOS data products it has received and retained according to established EOSDIS standards. | 211570 |
| 3.1.2.9.11 | The ECS shall provide access to International Partner directory information. | 211571 |
| 3.1.2.9.12 | The ECS shall provide the interface to order data from International Partner information systems. | 211572 |
| 3.1.2.9.13 | The ECS shall allow users to select and order data granules by a number of attributes, which may include, but not be limited to: spacecraft, instrument, geophysical parameter, temporal coverage, spatial coverage, processing level, and grid type. | 210656 |
| 3.1.2.9.14 | The ECS shall be available 24 hours per day to provide information management services to EOSDIS users. | 210659 |
| 3.1.2.9.15 | The ECS shall maintain a full and complete accounting of all EOSDIS resources used and of all data distributed to users. | 210624 |
| 3.1.2.9.16 | The ECS shall serve as an information source and connection point to external data systems and archives that produce, process, and/or maintain Earth science data sets and that have agreed to make the information and services available to EOSDIS. | 211286 |
| 3.1.2.9.17 | The ECS shall provide access to non-EOS data that have been generated by external data systems or is stored by external archives as requested by EOSDIS users or required as correlative data for production processing, in accordance with established Memoranda of Understanding (MOUs) and project pre-authorization. | 211274 |
| 3.1.2.9.18 | The ECS shall generate reports on the status of the system, the data volume handled, and the backlog of data requests. | 210658 |
| 3.1.2.9.19 | The ECS shall have the capability for maintenance and administration of the ECS data, metadata, and database management systems under appropriate controls, and shall provide and maintain a log of all updates and purges. | 210877 |

- 3.1.2.9.20 The ECS shall institute and perform procedures to assure that inventory and directory entries are current and valid. 211345
- 3.1.2.9.21 The metadata shall be expandable to include additional attributes which are identified during the mission and deemed useful for data search. 211451
- 3.1.2.9.22 The ECS shall produce, maintain, and provide access to descriptions of stored spacecraft housekeeping and ancillary data parameters. 211452
- 3.1.2.9.23 The ECS shall provide computation tools for applying conversion, calibration and transformation coefficients and algorithms to spacecraft housekeeping and ancillary data parameters extracted from data storage through user requests. 211453
- 3.1.2.9.24 The ECS shall provide a capability for users to interactively access spacecraft housekeeping and ancillary data parameters, extract identified parameters from data storage, and retrieve these parameters. 211454
- 3.1.2.9.25 The ECS shall provide science users with software to facilitate transfer of locally managed data and information to the ECS. 211604
- 3.1.2.10 System Management**
- 3.1.2.10.1 The ECS shall support the development and management of coordinated, system-wide ground event schedules. 211587
- 3.1.2.10.2 The ECS shall provide system-wide configuration management capabilities. 211542
- 3.1.2.10.3 The ECS shall provide system-wide performance management capabilities. 211545
- 3.1.2.10.4 The ECS shall provide system-wide security management capabilities. 211588
- 3.1.2.10.5 The ECS shall provide system-wide fault management capabilities. 211589
- 3.1.2.10.6 The ECS shall provide system-wide accounting and accountability capabilities. 211590
- 3.1.2.10.7 The ECS shall be capable of system-wide collection, display and report generation of its system management information (eg., operational status, processing schedules, security and fault information). 211591
- 3.1.2.10.8 The ECS shall receive management information from EBnet and EDOS. 211592
- 3.1.2.10.9 The ECS shall provide the capability to monitor ground resources (i.e., hardware and software). 211593
- 3.1.2.10.10 The ECS shall provide on-line high-level system status information for all ECS elements. 211547
- 3.1.2.10.11 The ECS shall provide the capability to monitor, system-wide, science data processing operations. 211594

- 3.1.2.10.12 The ECS shall maintain system-wide management information and resources information. 211595
- 3.1.2.10.13 The ECS shall maintain user audit trails for security and other accountability conditions. 211596
- 3.1.2.10.14 The ECS shall provide the capability to account for resource utilization. 211597

3.1.2.11 Integration, Verification and Test

- 3.1.2.11.1 The ECS shall support verification of investigator provided algorithms, calibration procedures and software, and processing software in an environment compatible with operations. 210891
- 3.1.2.11.2 The ECS shall support verification of all external interfaces (e.g., EDOS). 211573
- 3.1.2.11.3 The ECS shall provide the capability to monitor system processes during testing. 211328
- 3.1.2.11.4 The ECS shall provide access for system test and Independent Verification and Validation (IV&V) personnel to stored test data sets, test plans, and procedures used in the check-out and verification of EOSDIS elements. 211329

3.2 ECS Evolutionary Approach Concepts

3.2.1 Distribution

- 3.2.1.1 The ECS shall be designed as a distributed system in which the elements are dispersed to take advantage of existing and future systems and local expertise. 211456
- 3.2.1.2 The ECS version changes shall not severely impact the interface to local existing systems. 211457

3.2.2 Phased Implementation

- 3.2.2.1 The ECS shall be implemented in a sequence of versions, each of which shall incorporate improvements and modifications based upon user experience with preceding versions. 211458
- 3.2.2.2 The data and metadata of Version 0 shall be made accessible by subsequent versions of ECS with equivalent or better levels of service. 211459
- 3.2.2.3 Migration from one version to another shall propagate community accepted standards and concepts from the previous versions to subsequent versions. 211460
- 3.2.2.4 The transition from one version to another shall be contingent upon user acceptance of the new version. 211461

- 3.2.2.5 The transition shall be accomplished with minimal interruption or degradation of services to EOSDIS users. 211462

3.2.3 Use of Standards

- 3.2.3.1 The ECS shall incorporate up-to-date industry standards at system interfaces. 211463
- 3.2.3.2 The ECS shall incorporate community-accepted standards for science user interfaces, such as user interface management systems, data exchange formats, data delivery media, metadata and browse data standards, and algorithm development computing environment. 211464
- 3.2.3.3 The ECS shall provide a capability for absorbing significant new standards in operating systems, data formats, software, and metadata formats in a way that is transparent to the current users of the system. 211465

3.2.4 Accommodating Hardware and Software Advances

- 3.2.4.1 The ECS shall ensure that system and applications software for EOS products maximize software transportability across potential EOS hardware and commercial off-the-shelf (COTS) software configurations throughout the EOS mission lifetime. 211466
- 3.2.4.2 The ECS hardware and COTS software products shall be reviewed at 1 year intervals against commercially available, compatible hardware and software, and replaced when comparative analysis of cost vs. performance or required capacity increases indicates a need. 211468
- 3.2.4.3 The ECS shall maximize the use of COTS hardware and software. 211574

3.2.5 Prototyping

- 3.2.5.1 The ECS shall prototype user sensitive and high risk technology areas. 211475
- 3.2.5.2 Prior to modification of the operational EOSDIS, prototypes of user sensitive and high risk areas shall be demonstrated to and accepted by the user community. 211476

3.2.6 Relationship to ADCs and Other Projects

- 3.2.6.1 The ECS shall provide interface capability to establish interoperability with ADCs to enable EOSDIS users to access ADC information management and data services. 211477

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Appendix A. Acronyms

| | |
|---------|-----------------------------------------------------|
| A/C | Air Conditioning |
| ACRIM | Active Cavity Radiometer Irradiance Monitor |
| AD | Applicable Document |
| ADC | Affiliated Data Center |
| ADEOS | Advanced Earth Observing Satellite |
| ADP | Automated Data Processing |
| ADPE | Automated Data Processing Equipment |
| AGS | Alaska Ground Station |
| AIAA | American Institute of Aeronautics and Astronautics |
| AIRS | Atmospheric Infrared Sounder |
| AIS | Automated Information Security |
| ALT | Altimeter |
| AMSU | Advanced Microwave Sounding Unit |
| ANSI | American National Standards Institute |
| AO | Announcement of Opportunity |
| Ao | Operational Availability |
| ARPANET | Advanced Research Projects Agency Network |
| ASCII | American Standard Code for Information Interchange |
| ASF | Alaska SAR Facility |
| ASTER | Advanced Spaceborne Thermal Emission and Reflection |
| AT | Acceptance Test |
| ATDRSS | Advanced TDRSS |
| AVHRR | Advanced Very High-Resolution Radiometer |
| BER | Bit Error Rate |
| BIP | Background Information Package |
| BOD | Beneficial Occupancy Date |

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| | |
|--------|----------------------------------------------------------------|
| Bps | Bytes per Second |
| bps | Bits Per Second |
| C&T | Communications and Tracking |
| CAD | Computer Aided Design |
| CASE | Computer Aided Software Engineering |
| CCB | Configuration Control Board |
| CCSDS | Consultative Committee for Space Data Systems |
| CDR | Critical Design Review |
| CDRD | Contract Data Requirements Document |
| CDRL | Contract Data Requirements List |
| CD-ROM | Compact Disk (Optical), Read-Only Memory |
| CEOS | Committee on Earth Observing Systems |
| CERES | Clouds and the Earth's Radiant Energy System |
| CFS | Conflict-Free Schedule |
| CIESIN | Consortium for International Earth Science Information Network |
| CM | Configuration Management |
| CO | Contracting Officer |
| Co-I | Co-Investigator |
| COTR | Contracting Officer's Technical Representative |
| COTS | Commercial Off-The-Shelf |
| CPT | Contractor Provided Training |
| CPU | Central Processing Unit |
| CRC | Cyclic Redundancy Code |
| CRR | Capabilities and Requirements Review |
| CSA | Canadian Space Agency |
| CSMS | Communications and System Management Segment |
| CWBS | Contract Work Breakdown Structure |
| DAAC | Distributed Active Archive Center |
| DADS | Data Archive and Distribution System |

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|----------|-------------------------------------------------------------------------|
| DAR | Data Acquisition Request |
| DBMS | Data Base Management System |
| DID | Data Item Description |
| DIS | Draft International Standard |
| DoD | Department of Defense |
| DR | Discrepancy Report |
| DSA | Directory System Agent |
| | |
| EAP | EOSDIS Advisory Panel |
| ECS | EOSDIS Core System |
| EDC | EROS Data Center |
| EDOS | EOS Data and Operations System |
| EMOWG | EOS Mission Operations Working Group |
| EOC | EOS Operations Center |
| EO-ICWG | Earth Observation International Coordination Working Group |
| EOS | Earth Observing System |
| EOSDIS | Earth Observing System Data and Information System |
| EOSP | Earth Observing Scanning Polarimeter |
| EPDS | Earth Probe Data System |
| EPOP | European Polar-Orbiting Platform |
| EROS | Earth Resources Observation System |
| ERS | Earth Remote-sensing Satellite |
| ESA | European Space Agency |
| ESN | EOSDIS Science Network |
| ETR | Element Test Review |
| EUMETSAT | European Organization for the Exploitation of Meteorological Satellites |
| FAR | Federal Acquisition Regulation |
| FDDI | Fiber Distributed Data Interface |
| FDF | Flight Dynamics Facility |

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|--------|---------------------------------------------------|
| FIPS | Federal Information Processing Standard |
| FOS | Flight Operations Segment |
| FOT | Flight Operations Team |
| FOV | Field of View |
| FSMS | File and Storage Management System |
| FTAM | File Transfer Access Method |
| FTP | File Transfer Protocol |
| GAO | General Accounting Office |
| GB | GigaByte (10^9) |
| Gbps | Gigabits per second |
| GCMD | Global Change Master Directory |
| GFE | Government Furnished Equipment |
| GGI | GPS Geoscience Instrument |
| GHB | Goddard Handbook |
| GLRS | Geoscience Laser Ranging System |
| GOES | Geostationary Operational Environmental Satellite |
| GOS | Geomagnetic Observing System |
| GOSIP | Government Open System Interconnection Profile |
| GSOP | Ground System and Operations Project |
| GSFC | Goddard Space Flight Center |
| H/W | Hardware |
| HDLC | High-level Data Link Control |
| HiRDLS | High-Resolution Dynamics Limb Sounder |
| HIRIS | High-Resolution Imaging Spectrometer |
| HVAC | High Voltage Alternating Current |
| I&T | Integration and Test |
| IAS | Instrument Activity Specification |
| IATO | Independent Acceptance Test Organization |

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|---------|------------------------------------------------------------------------|
| ICC | Instrument Control Center |
| ICD | Interface Control Document |
| ICF | Instrument Control Facility |
| ICN | International Communications Network |
| IDB | Instrument Data Base |
| IEEE | Institute of Electrical and Electronics Engineering |
| IEEE-CS | Institute of Electrical and Electronics Engineering – Computer Science |
| II | Interdisciplinary Investigator |
| ILS | Integrated Logistics Support |
| ILSMT | Integrated Logistics Support Management Team |
| IMS | Information Management System |
| IP | International Partner |
| IPEI | Ionospheric Plasma and Electrodynamics Instrument |
| IRD | Interface Requirement Document |
| ISAR | Instrument Support Activity Request |
| ISO | International Standards Organization |
| IST | Instrument Support Terminal |
| ITIR | Intermediate and Thermal Infrared Radiometer |
| IV&V | Independent Verification and Validation |
| IWG | Investigator Working Group |
| JEOS | Japanese Earth Observing System |
| JPL | Jet Propulsion Laboratory |
| JPOP | Japanese Polar Orbiting Platform |
| KB | KiloByte (10^3) |
| KBps | Kilobytes per Second |
| Kbps | Kilobits Per Second |
| km | kilometer |
| KSA | Ku-band Single Access |
| L0 | Level Zero |

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|---------|--------------------------------------------------|
| L1A | Level 1A |
| LAN | Local Area Network |
| LaRC | Langley Research Center |
| LAWS | Laser Atmospheric Wind Sounder |
| LCC | Life Cycle Costing |
| LIS | Lightning Imaging Sensor |
| LRU | Line Replaceable Unit |
| LSM | Local System Management |
| LTIP | Long Term Instrument Plan |
| LTSP | Long Term Science Plan |
| M&O | Maintenance and Operations |
| MA | Multiple Access |
| MAC | Medium Access Control |
| MB | MegaByte (10^6) |
| MBps | Millions of Bytes per Second |
| Mbps | Megabits per second |
| MDT | Mean Down Time |
| MFD | Master File Directory |
| MFLOPS | Million Floating Point Operations per Second |
| MILNET | Military Network |
| MIMR | Multifrequency Imaging Microwave Radiometer |
| MISR | Multi-angle Imaging Spectro-Radiometer |
| MLS | Microwave Limb Sounder |
| MO&DSD | Mission Operations and Data Systems Directorate |
| MODIS-N | Moderate-Resolution Imaging Spectrometer – Nadir |
| MODIS-T | Moderate-Resolution Imaging Spectrometer – Tilt |
| MOM | Mission Operations Manager |
| MOPITT | Measurements of Pollution in the Troposphere |
| MOTIS | Message Oriented Text Interchange System |

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|-----------|------------------------------------------------------------------------|
| MOU | Memorandum of Understanding |
| MS | Mass Storage |
| MSFC | Marshall Space Flight Center |
| MTBF | Mean Time Between Failure |
| MTBCM | Mean Time Between Corrective Maintenance |
| MTBM | Mean Time Between Maintenance |
| MTBPM | Mean Time Between Preventive Maintenance |
| MTTR | Mean Time To Repair |
| NARA | National Archives and Records Administration |
| NASA | National Aeronautics and Space Administration |
| NASCOM | NASA Communications |
| NASCOM II | NASCOM Augmentation |
| NASDA | Japanese National Space Agency |
| NATO ASI | North Atlantic Treaty Organization Advanced Study Institutes |
| NCAR | National Center for Atmospheric Research |
| NCC | Network Control Center |
| NCDC | National Climatic Data Center (NOAA) |
| NCSL | National Computer Systems Laboratory |
| NESDIS | National Environmental Satellite, Data, and Information Service (NOAA) |
| NGDC | National Geophysical Data Center (NOAA) |
| NHB | NASA Handbook |
| NIST | National Institute of Standards and Technology |
| NMI | NASA Management Instruction |
| NOAA | National Oceanic and Atmospheric Administration |
| NODC | National Oceanographic Data Center (NOAA) |
| NREN | National Research and Education Network |
| NRP | National Resource Protection |
| NSA | National Security Agency |
| NSCAT | NASA Scatterometer |

| | |
|--------|---------------------------------------------------------------------|
| NSF | National Science Foundation |
| NSI | NASA Science Internet |
| NSIDC | National Snow and Ice Data Center |
| NSN | NASA Science Net |
| NSSDC | National Space Science Data Center |
| NTISSP | National Telecommunications and Information Systems Security Policy |
| O/A | Orbit and Attitude |
| OBC | OnBoard Computer |
| OCM | Ocean Color Mission |
| ODC | Other Data Center |
| OJT | On-the-Job Training |
| OMB | Office of Management and Budget |
| ORU | Orbital Replacement Unit |
| OSI | Open Systems Interconnection |
| PA | Product Assurance |
| PAIP | Performance Assurance Implementation Plan |
| PAR | Performance Assurance Requirements |
| PB | PetaByte (10^{15}) |
| PCAR | Platform Core Activity Request |
| PDB | Project Data Base |
| PDL | Program Design Language |
| PDR | Preliminary Design Review |
| PGS | Product Generation System |
| PHS&T | Packaging, Handling, Storage, and Transportation |
| PI | Principal Investigator |
| PI/TL | Principal Investigator/Team Leader |
| PM | Preventive Maintenance |
| PMR | Project Management Review |
| PMS | Performance Measurement System |

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|----------|---------------------------------------------------------------|
| PMSR | Performance Measurement Status Report |
| POEM | Polar Orbit Earth Observation Mission |
| POP | Polar Orbiting Platform |
| POSIX | Portable Operating System Interface for Computer Environments |
| PRR | Program Requirements Review |
| PSAT | Predicted Site Acquisition Table |
| PSCN | Program Support Communications Network |
| QA | Quality Assurance |
| QAR | Quality Assurance Representative |
| RFC | Request For Change |
| RID | Review Item Discrepancy |
| RMA | Reliability, Maintainability, Availability |
| RRR | Release Readiness Review |
| SA | Single Access |
| SAFIRE | Spectroscopy of the Atmosphere Using Far Infrared Emission |
| SAGE III | Stratospheric Aerosol and Gas Experiment III |
| SAP | Software Assurance Plan |
| SAR | Synthetic Aperture Radar |
| SCF | Science Computing Facility |
| SDPS | Science Data Processing Segment |
| SDR | System Design Review |
| SDSD | Satellite Data Services Division (NOAA) |
| SeaWiFS | Sea-viewing Wide Field of View Sensor |
| SGS | Svalbard Ground Station |
| SIRD | Support Instrumentation Requirements Document |
| SMAP | Software Management and Assurance Program |
| SMC | System Management Center |
| SN | Space Network |
| SNC | Space Network Control |
| SOLSTICE | Solar Stellar Irradiance Comparison Experiment |

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|----------|-----------------------------------------------|
| SOM | Science Operations Manager |
| SORR | Segment Operational Readiness Review |
| SOW | Statement of Work |
| SPAN | Space Physics Analysis Network |
| SPAR | Software Performance Assurance Representative |
| SPSS | Statistical Package for the Social Sciences |
| SRR | System Requirements Review |
| SSA | S-band Single Access |
| SSM/I | Special Sensor for Microwave Imaging |
| STA | Space Technology Agency (Japan) |
| STDN | Satellite Tracking and Data Network |
| STGT | Second TRDS Ground Terminal |
| STIKSCAT | Stick Scatterometer |
| STIP | Short Term Instrument Plan |
| STOL | System Test and Operations Language |
| STOP | Short Term Operations Plan |
| SWIRLS | Stratospheric Wind Infrared Limb Sounder |
| TAG | Technical Assistance Group |
| TB | Terabyte (10^{12}) |
| TBD | To Be Determined |
| TDRS | Tracking and Data Relay Satellite |
| TDRSS | Tracking and Data Relay Satellite System |
| TES | Tropospheric Emission Spectrometer |
| TIP | Technical Information Program |
| TL | Team Leader |
| TM | Team Member |
| TMR | Topex/Poseidon Microwave Radiometer |
| TOMS | Total Ozone Mapping Spectrometer |
| TOO | Target of Opportunity |

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|-------|-------------------------------------|
| TOPEX | Topography Experiment |
| TOVS | TIROS Operational Vertical Sounder |
| TRMM | Tropical Rainfall Measuring Mission |
| TRR | Test Readiness Review |
| UAF | University of Alaska at Fairbanks |
| UARS | Upper Atmosphere Research Satellite |
| UAV | User Antenna View |
| UPS | Uninterruptible Power Supply |
| USE | User Support Environment |
| USGS | U.S. Geological Survey |
| VCDU | Virtual Channel Data Units |
| WBDCS | Wide-Band Data Collection System |
| WBS | Work Breakdown Structure |
| WSGT | White Sands Ground Terminal |
| WTR | Western Test Range |
| WOTS | Wallops Orbital Tracking Station |
| XIE | X-ray Imaging Experiment |